

## QUARTERLY REVIEW

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GEOLOGIC INVESTIGATION IN THE STATE OF UTAH

August 1964

## A "FIRST" FOR THE SURVEY

This issue of the Utah Geological Survey's QUARTERLY REVIEW represents the first of a quarterly series contemplated by the Utah Survey. The QUARTERLY REVIEW is intended as a review or summary of information pertaining to the geology and mineral industry of Utah. Each future issue (released four times each year — August, November, February, May) will feature some facet of the State's geology, mineral inventory, or water resources which, in the opinion of the Survey, will be timely and of interest to the readers of the QUARTERLY REVIEW. Thus, the publication is not limited purely to academic geology, but will offer helpful and informative statements concerning a variety of interesting and related subjects — geologic formations, mineral deposits, active geologic investigations, activities of various organizations regarding the mineral industry of the State, notices of conferences, field trips, or other events of special interest, announcements of new publications.

It is hoped that the QUARTERLY REVIEW will be of interest and benefit to its readers. As this is a "first" for the Utah Survey, your comments would be appreciated.

## Quarterly Review

State of Utah ..... George Dewey Clyde  
Governor

University of Utah..J. C. Fletcher, Ph.D.  
President

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# UTAH'S WATERTENDERS

## Who's Who in Utah's Water Activities

The water resources of the State of Utah represent a natural resource which is most vital to the socio-economic welfare of the people. There is no acceptable substitute for water; and, although needs and demands for the precious substance are constantly increasing, the amount of available water does not change. Therefore, the utilization of this resource is of prime importance. The purpose of the following article is to focus greater attention upon the organizations, both State and Federal, which play an active role in the utilization, conservation, and future planning for Utah's water resources.

### State Agencies Engaged in Water Activities

Although twelve state agencies are engaged in water resources ac-

tivities and related projects (Figure 1), only three have the primary functions of development and/or administration of water resources — the Office of the State Engineer, the Utah Water and Power Board, and the Water Pollution Control Board.

Following is a brief resume of the water responsibilities assigned to each of the three organizations:

**State Engineer.** The Office of the State Engineer, established in 1903, is responsible for general administration and supervision of the waters of Utah. Measurement, appropriation, apportionment, and distribution of the State's waters come under the jurisdiction of this Office. The State Engineer is empowered to make and publish rules and reg-

(continued on page 2)

ACTIVITY	STATE AGENCY											
	State Engineer	Water & Power Board	Water Pollution & Control Board	Park & Recreation Commission	Fish & Game Commission	Land Board	Forestry & Fire Control	Bureau of Sanitation	Board of Agriculture	State Road Commission	Oil & Gas Conservation Comm.	Utah Geological Survey
Flood Control	X	X			X		X			X		
Irrigation	X	X	X		X	X		X	X			
Drainage	X	X			X				X	X		
Water Supply	X	X	X	X		X	X	X	X			X
Data Gathering	X	X	X		X			X				X
Water Rights	X	X	X		X	X		X		X		
Project Planning	X	X		X	X	X			X			
Pollution Control	X	X	X	X	X	X		X	X	X		X
Recreation	X	X	X	X	X			X	X		X	X
Fish & Wildlife	X	X	X	X	X	X	X	X		X		
Watershed Treatment	X	X	X		X	X	X		X			
Construction & Inspection	X	X	X		X	X	X		X			

FIGURE 1. State agencies involved in water-resources activities and the particular phases with which they are concerned.

ACTIVITY	FEDERAL AGENCY	Corps of Engineers	Bureau of Reclamation	Soil Conservation Service	Bureau of Indian Affairs	Bureau of Land Management	Fish & Wildlife Service	Geological Survey	National Park Service	Bureau of Mines	Forest Service	Agriculture Conservation Service	Rural Electrification Association	Farmers Home Administration	Weather Bureau	Public Health Service	Federal Power Commission	Agricultural Research Service	Housing & Home Finance
Flood Control		X	X	X	X	X		X			X	X			X			X	
Irrigation		X	X	X	X			X				X		X	X			X	
Drainage		X	X	X	X	X		X				X		X				X	
Water Supply		X	X	X	X	X		X			X	X		X	X	X		X	X
Pollution Control		X	X				X			X						X			
Improvements to Navigation		X	X					X											
Recreation, Fish & Wildlife		X	X			X	X		X		X					X			
Watershed Treatment			X	X	X	X	X	X	X		X	X							
Power Generation		X	X		X			X		X			X		X		X		
Power Transmission & Distr.		X	X		X								X				X		

FIGURE 2. Federal agencies involved in water resources activities and the particular phases with which they are concerned.

## WATERTENDERS

(continued from page 1)

ulations in order to secure the equitable and fair apportionment and distribution of water according to the respective rights of appropriators. He also has authority to bring suit to enjoin unlawful appropriation, diversion, and use of both surface and underground water and to prevent waste and loss thereof. With the approval of the Governor, the State Engineer is authorized to enter into agreements with any federal or state agency, subdivision, or institution, for obtaining basic data and information essential for the administration and adjudication of water rights. The State Engineer has exercised this authority by maintaining co-operative agreements with (1) the U.S. Geological Survey, to obtain data on both surface and ground water; (2) the Soil Conservation Service, in connection with its snow surveys and water supply forecasts; and (3) the Utah Agricultural Experiment Station and the Agricultural Research Service for studies of consumptive use and irrigation efficiencies. In addition, the State Engineer has co-operated in other special studies. The Office of the State Engineer also conducts studies of its own, such as inventorying municipal water uses in order to obtain facts needed in developing a sound policy on how

to act on pending municipal water applications.

The State Engineer's Office processes all applications to appropriate water, evaluates and determines water rights, supervises the diversion of water into new areas, analyzes the distribution program on established river systems, inspects plans and specifications for dams and diversion structures, inspects dams and reservoirs in the State to see if maintenance practices are adequate, and provides technical and administrative assistance to water users.

One of the important functions of the State Engineer pertains to the adjudication of existing rights. Adjudication is the process of adjusting water rights to fit changing conditions and to correct inequalities in allocations. If for any good reason the appropriators wish a new survey and allocation of the waters of a stream, they may petition the court for such a change. The State Engineer is then instructed by the courts to make a complete study of the water rights of the lands irrigated, of irrigation systems, and of all pertinent information having a bearing on the water rights situation. After obtaining this information and allowing all users to present their claims, the State Engineer prepares a schedule showing how the waters of the streams or stream system are to be allocated

to the several users. This schedule is presented before the court, which hears evidence from all users for or against the proposed schedule. The court then issues a decree setting forth the manner in which the waters should be distributed among the users. The State Engineer is charged with the responsibility of seeing that water is distributed according to court decrees and according to the rights of all water users. He is delegated with police powers and with semijudicial powers which permit him to carry out his responsibility.

**Water and Power Board.** The Utah Water and Power Board was established in 1947, when the State Legislature appropriated one million dollars for a state-wide water development and conservation program. The original intent was for successive legislatures to add one million dollars each biennium until a \$10,000,000 revolving fund was established. This was to be used "... to the end that every mountain stream and every water resource within the State be made to render its highest beneficial service. . . ."

Some of the powers and responsibilities of the Board are as follows:

(a) To make studies, investigations, and plans for the full development, utilization, and promotion of water and power resources of the State, including preliminary sur-

(continued on page 4, column 1)

## ARTHUR L. CRAWFORD RETIRES

After fifteen years of dedicated service to the Utah Geological Survey, Arthur L. Crawford retired from his Survey position July 1, 1964.

Mr. Crawford has led a busy and useful career in the geological sciences. He received his A.B. at Brigham Young University in 1924 and his M. A. at Stanford University in 1926. He has taught geology and mineral technology at Brigham Young University, University of Wyoming, and at the University of Utah.

Some of the positions he has held include: Director of Cooperative Microscopic Research Laboratories, University of Utah; Geologist and Mineral Technologist for the Utah Engineering Experiment Station, University of Utah; Raw Materials Engineer for Geneva Steel Company; Commissioner of the Utah State Department of Publicity and Industrial Development; and Director and Assistant Director of the Utah Geological and Mineralogical Survey.

We salute Mr. Crawford for his services to the Survey and wish him success in his future endeavors.

## LATEST WORD ON STATE MAP

Dr. Wm. L. Stokes, Dept. of Geology, Univ. of Utah, reports that final proof on the Southeast Quadrant of the State Map, (the final quadrant to be released) was returned to the printer August 24, 1964. The map is expected to be available in early 1965.

The Northeast, Northwest, and Southwest quadrants are now available (scale 1:250,000) from the Utah Geological Survey at a cost of \$3.50 over-the-counter, and \$4.00 post paid.

Sea water contains 3.5% by weight of dissolved substances.

Great Salt Lake Brine contains over 27.5% by weight of dissolved substances.

# U.S.G.S. HEAVILY INVOLVED IN STATE WATER RESOURCES PROGRAM

The Water Resources Division of the U.S. Geological Survey conducts investigations through collecting basic hydrologic data, areal studies of water resources, and research of factors which affect water, its development, conservation, and use.

In fiscal 1964, eighty-two per cent of the U.S. Geological Survey Water Resources Division's funds and energy will be expended in co-operative programs on a matching fund basis with State agencies and other governmental units. Seven per cent of their effort will be supported by funds from other Federal agencies and eleven per cent will be supported by funds appropriated directly to the Geological Survey.

### Collection of Hydrologic Data

Approximately 196 gaging stations (twelve new) will comprise the gaging station network which is maintained to provide records for development of a State water plan. This is principally a co-operative effort with the Utah State Engineer, supplemented by Salt Lake County, the Bear River Compact Commission, and funds from other Federal agencies.

Collection of records of magnitude and frequency of floods is being co-operatively supported by the Utah State Highway Department and is at the mid-point of a ten-year study. Approximately 125 crest-stage gages are maintained to collect flood records.

The Utah State Engineer co-operates in gathering data on water levels from a network of 386 wells semiannually, and from 31 wells with automatic water-level recorders. About 250 wells and springs are included in the water quality network; the chemical quality and temperature are determined periodically.

### Areal Studies

Investigations to be carried on in the fiscal year 1964 are listed with the co-operating agency:

Chemical hydrology of Great Salt

Lake—Utah Geological and Mineralogical Survey.

Chemical characteristics of the water resources of western Utah — Utah Geological and Mineralogical Survey.

Springs of Utah — Utah Geological and Mineralogical Survey.

Geology and ground-water resources of the upper Sevier Valley — Utah State Engineer.

Ground-water conditions in Utah — Utah Water & Power Board.

Surface-water supplies in Utah — Utah Water & Power Board.

Ground-water hydrology of Sevier Desert, Millard and Juab Counties — Utah State Engineer.

Ground-water resources of selected basins in southwestern Utah — Utah State Engineer.

Ground-water resources of southern Utah Valley — Utah State Engineer.

Ground-water resources of the Sanpete Valley — Utah State Engineer.

Ground-water resources of the Sevier River basin between Yube Dam and Leamington Canyon — Utah State Engineer.

Hydrologic reconnaissance of the basins of western Utah — Utah State Engineer.

Reevaluation of ground-water conditions in Tooele Valley — Utah State Engineer.

Bedrock aquifers in the Colorado Plateaus of Utah — Utah Oil & Gas Commission.

Water resources of Salt Lake County — Several agencies.

### Salt Lake County Study

The most comprehensive areal investigation is the study of the water resources of Salt Lake County. The objectives are to provide solutions to some of the area's water problems and to provide a scientific basis for selecting the best of alternative solutions. The study will involve: (1) water use, (2) consumption, (3) seepage losses, (4) natural recharge and discharge of the ground-water reservoir, (5) ef-

(continued on page 4, column 1)

## U.S.G.S. ACTIVITIES

(continued from page 3)

fect on a quality and quantity of recharge caused by changes of land use, (6) amount of additional ground water that can be developed by pumping and artificial recharge. Currently, funds are matched with those provided by the Utah State Engineer, Utah Water and Power Board, Utah Fish and Game Department, Salt Lake County Water Conservancy District, Metropolitan Water District of Salt Lake City, Salt Lake County, Kennecott Copper Corporation, Utah Power and Light Company, and Salt Lake Chamber of Commerce.

## WATERTENDERS

(continued from page 2)

veys, stream gaging, examinations, tests, and cost estimates, either separately or in consultation with federal, state, and other agencies.

(b) To enter into contracts for the construction of conservation projects which will conserve and utilize the water and power resources of the State.

(c) To supervise, in co-operation with the Governor, all interstate compact negotiations and the administration of such compacts affecting the waters of interstate rivers, lakes, and other sources of supply.

(d) To cooperate with Federal and other agencies for water development, conservation, protection, and control of water and power resources of the State.

In implementing its powers and duties, the Utah Water and Power Board conducts detailed studies and engineering surveys of the water and power resources of the State. Some of these are handled by cooperative agreement with various state and federal agencies.

An extremely important function of the Water and Power Board is its development and construction of projects which meet engineering and economic feasibility criteria. These projects are financed on a 100 per cent reimbursable basis without interest. To date, \$10,755,325 have been expended for the development of 201 projects. There have been no defaults on repayment contracts with the Board.

All are of significant importance to the better utilization of Utah water and are a stimulus to attainment of other economic benefits.

Worthwhile partnership projects are generally limited to those too small for consideration by the Bureau of Reclamation, but beyond the capacity of irrigation companies without some type of financial and engineering aid. This development program is unique among western states. It has provided for the construction of many smaller projects which often show a greater return per unit of investment than the large projects which get the headlines.

**Water Pollution Control Board.** The Water Pollution Control Board is the most recently established of the trio of state agencies having principal concern with water. Established in 1953 to develop programs for the prevention, control, and abatement of new or existing pollution of waters in the State, the Board conducts studies, surveys, and investigations deemed essential. Based on the information at hand, the Board classifies waters of the State according to their most reasonable uses, and establishes standards of quality for each classification. Following assignment of classification and standards to various State waters, the Board maintains a surveillance and regulatory program for the purpose of preserving the quality of all waters.

The Board also sets standards for the public water supplies and has a continuing program for reviewing the classification and rating of these supplies.

The passage of the Water Pollution Control Act in 1953 has been largely responsible for encouraging construction of modern waste-treatment facilities valued at some 17 million dollars and for the upgrading of the public water supplies of many Utah towns and cities.

**Federal Programs.** In recent years the Federal Government has played an increasingly greater role in water resource development in the State. Both the number of federal agencies and their functions have been gradually enlarged. This has come about partly as a result

of the increasing emphasis on multiple-use concepts in all agencies, and partly as a result of projects becoming too large for private groups, local governmental units, or even states, to undertake.

There are eighteen Federal agencies in Utah which have programs related to water use and control (Figure 2), and the extent to which these agencies engage in water-related activities varies greatly. Collectively, their efforts have proved of great value to the State. Space does not permit a detailed description of the functions and accomplishments of each of the agencies. The phase of water development in which each is active are indicated in Figure 2.

The most extensive federal program for development of Utah's water resources is in connection with the Upper Colorado River Storage Project. This massive project was initiated by Public Law 485 approved on April 1, 1956. A plan for river regulation and participating projects has been formulated by the Bureau of Reclamation in co-operation with other Federal agencies and with the States of the Upper Colorado River Basin. Within the limits of the general allocation of water to the various states, each may develop projects to consume its entitlement of the river.

Water of the Colorado River was divided between the Upper and Lower Colorado River Basins by the Colorado River Compact. Among other things, the Compact apportions to the Upper Basin the beneficial consumptive use of 7,500,000 acre-feet of water per annum. Water allocated to the Upper Basin by the Colorado River Compact was further apportioned to the individual states of the Upper Basin by the Upper Colorado River Basin Compact, signed in 1948. Under this apportionment, Utah is permitted to consume 23 per cent of the Upper Basin allocation, or 1,714,000 acre-feet.

Existing and anticipated depletions by the participating projects in Utah will utilize 930,000 acre-feet of the Upper water which is



54 per cent of Utah's allocation. However, future projects, if built, would require an additional 1,200,000 acre-feet of water. Thus, if all projects present and future were implemented, Utah would utilize 1,950,000 acre-feet of water, or 14 per cent more than its compact entitlement of 1,714,000 acre-feet. To assure that stream depletions will fall within the compact allocation, Utah may have to revise some of its current development plans.

## WATER ROLE DOMINANT TO DEVELOP UTAH COAL

The Utah Construction Company has filed permits for drilling 161 wells for at least 110-sec. feet of water in Kane County to support a 2 million kilowatt coal-fired electric generating plant. At least two reservoirs and a 500-family community are also contemplated.

The timely publication of *Water-Resources Bulletin* 5, "Reconnaissance of Water Resources of a part of Western Kane County, Utah" by Harry D. Goode, Department of Geology, University of Utah, in August 1964, has provided valuable information for this enterprise.

## WATER'S ROLE IN OIL FIELD MANAGEMENT

The Utah Oil and Gas Conservation Commission is co-operating with the Ground Water Branch of the Water Resources Division of the U.S. Geological Survey on a study of the "Quality of Bedrock Aquifers for the Colorado Plateaus of Utah." The data is to be used for establishing well completion and abandonment practices as well as for salt water disposal and injection practices.

A tar sand installation capable of producing 10,000 barrels (42 gallon) of petroleum products per day would require 5.8 acre-feet of water per day.

**Water** — A colorless limpid liquid compound of hydrogen and oxygen.

# UTAH SURVEYS WATER ACTIVITIES

The Utah Geological Survey is responsible for "the survey of geological formations of the State with special reference to their economic contents, values and uses, such as: "... mineral waters and other surface and underground water supplies ... their kind and availability; and the promotion of the marketing of mineral products of the State." The foregoing partial objective of the Survey infers that the Utah Survey has very broad responsibilities in water resources; however, for fiscal reasons the Survey has been restricting its activities to water suspected to contain significant minerals, such as those of hot springs, oil field waters, and brines of salt flats, salt lakes, and subsurface waters of desert playas. Trace amounts of rarer elements contained in surface and subsurface waters deem a quality of water program a necessity, and the Survey supports and endorses such analytical work.

Currently the Survey is sampling and analyzing brines and sediments of the Great Salt Lake Desert to determine their mineral content. The project will be continuing and will afford progressively refined estimates and distributions of the available elements in the surface brines.

Co-operative projects being carried out with the Quality of Water Branch, Water Resources Division of the U.S. Geological Survey are as follows:

(1) Chemical hydrology of Great Salt Lake — This project is a continuation of an existing study on dissolved mineral inflow to the lake. The study is being broadened to determine the variations of the chemical composition of the brine and whether or not mineral transport within the lake will be detrimental to mineral development.

In 1957, the Southern Pacific Railroad completed a causeway across the lake which divided the

lake into northern and southern parts. Dr. Thomas O. Adams and others noted that the causeway was affecting salt concentration in that the northern arm was becoming saltier. Results of preliminary sampling as of December 1963 indicated that a ten per cent difference existed in the dissolved-solids content of the brine of the two lake arms, the northern segment containing the higher concentration.

(2) Chemical characteristics of the water resources of western Utah — This project is a continuation of a 1963 study designed to support and aid investigations of the mineral content of playas and closed basins of western Utah.

(3) Springs of Utah — This is a twofold project in which will be gathered (a) basic physical and chemical data on thermal springs and (b) physical and chemical data on Utah's major springs. An immediate objective is to use part of this data to support an appraisal, the geothermal power potential of Utah.

A steam electric plant capable of using one million tons of coal per year would use 2740 tons of coal and 19.3 acre-feet of water per day, or 2557 gallons of water for one ton coal.

An oil shale installation capable of producing 10,000 barrels (42 gallon) of petroleum products per day would require 2.8 acre-feet of water per day.

A coal hydrogenation installation capable of producing 10,000 barrels (42 gallon) of petroleum products per day would require 23.4 acre-feet of water per day.

Today over 1000 mutual irrigation enterprises operate in Utah.

## PENDING CONFERENCES

### IAPG MEETS IN UINTA BASIN

The Intermountain Association of Petroleum Geologists, their thirteenth annual field conference beginning September 16, 1964 and continuing through September 19, 1964, selected as the area of the conference the UINTA BASIN. The field trip is to cover the Tertiary through the Cretaceous and parts of the older geologic section on the northeast, southwest, and northwest corners of the Basin. Some of the observations to be made include the east-west and north-south stratigraphic changes in surface rock; the phosphate, oil shale, and bituminous sandstone deposits; and the gilsonite operations within the area.

A guidebook, "Utah's Hydrocarbon Storehouse," published in connection with the conference sells for \$10.00 and is available from the I.A.P.G. and the Utah Geological Survey. In addition to coverage of the geologic formations of the Uinta Basin, the guidebook contains a wide scope of papers covering the mineral wealth of the basin — oil and gas fields, bituminous sandstones, oil shales, gilsonite, phosphate, and coal. Many papers include technological aspects of utilizing this mineral wealth.

### UINTAH CO. BULLETIN RELEASED

Utah Geological Survey Bulletin 72, *GEOLOGY OF UINTAH COUNTY*, by G. E. and B. R. Untermann, was released for sale in August. This 112-page bulletin contains a scholarly treatment of the general geology of Uintah County. A previously published map (in two sections), is included as part of the bulletin. In addition to the map, there are 49 line drawings and photographs throughout the text. The bulletin is available from the Utah Geological Survey Office for \$2.00.

### WASATCH FAULT TRIP

The Utah Geological Society will conduct its 1964 field trip along the Wasatch Fault complex from Provo to Ogden on October 10, 1964. The chairman of the field trip event is Dr. Ray E. Marsell, Professor Emeritus of the University of Utah and presently a consultant for Utah Water & Power Board.

The southern portion of the fault complex will be described by Dr. Harold Bissell, Brigham Young University; the Salt Lake City area by Dr. Ray E. Marsell; and the northern end by Dr. Walter R. Buss, Weber College.

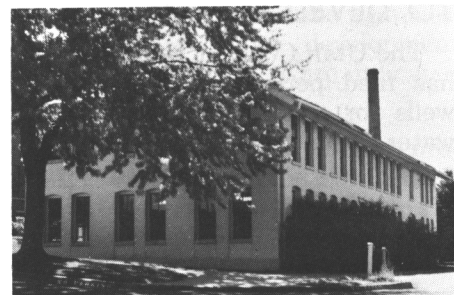
### FOSSIL HYDROCARBON SYMPOSIUM

A symposium designed to point out the economic potential of the vast "Fossil Hydrocarbon Resources" of the Intermountain West, including geographic location, reserves, extraction methods, conversion processes, transportation mediums, end uses, and economic development and marketing of fossil hydrocarbons (coal, oil shale, bituminous sand, gilsonite, viscous crudes, petroleum and gas) is being sponsored by Brigham Young University. This event has been planned in co-operation with the Utah Mining Association, Utah-Wyoming Coal Operator's Association, the Utah Petroleum Council, and the Rocky Mountain Oil and Gas Association. The symposium will take place Friday and Saturday, October 9 and 10, 1964, at the Hotel Utah, Salt Lake City, Utah.

Participating professional societies include: Intermountain Association of Petroleum Geologists, Utah Association of Petroleum Landmen, Utah Chapter of the Institute of Chemical Engineers, Utah Section of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Utah Chapter of the American Society of Mechanical Engineers, and Utah Geological Society. General Chairmen of the event are Dr. Armin J. Hill, and Dr. Bill J. Pope, both from the Brigham Young University.

### SURVEY'S HOME

The Utah Geological and Mineralogical Survey is housed on the campus of the University of Utah — 103 Civil Engineering Building (First South and Walcott Avenue) — where it occupies the northern half of the first floor of the building shown below. From this office are available official maps, bulletins, and circulars concerning Utah's resources. A List of Publications may be obtained by writing to the Office of the Utah Geological Survey; or if convenient, by stopping by the Survey office. Inside you



*Home of the Utah Survey*

will find a large map display rack where you may browse through various maps (for sale and also some free-of-charge) concerned with the geology and mineral resources of the State of Utah. Also you will find many free publication to add to your library. The Survey staff may be able to help you find the answer to questions you have concerning the mineral industries and potentialities of the State.

Publications represent only the final phase in the work and responsibilities of the Survey. Various programs of geologic research are conducted by Survey geologists. Also, the Survey is enjoined to cooperate with all existing agencies both State and Federal, to the end that the geological and mineralogical resources of Utah may be most advantageously investigated and publicized for the good of the state.

The Survey also maintains a **LIBRARY OF SAMPLES FOR GEOLOGIC RESEARCH**, where stratigraphic sections, drill cores, well cuttings, and miscellaneous samples of geologic significance are established. For catalogs, facilities, and minimal service fees, contact the Survey office.

## SALT LAKE DESERT PROJECT

The Utah Geological Survey has initiated a project to ascertain the existing elements in the brines of the soluble interstitial materials of the Great Salt Lake Desert surficial sediments. This project is to be intermittently continued, depending on time and funds available.

The Great Salt Lake Desert not only is immense in area and generally inhospitable, but also has the U.S. Army and the U.S. Air Force as tenants. With such in mind, it can be reasoned that such a study will be difficult. Time-consuming analytical work is expected to lag the sampling program.

## OIL WELL BRINES

The U.S. Bureau of Mines, co-operating with the Utah Oil and Gas Conservation Commission and the Utah Geological Survey, is investigating the mineral content of oil field brines. The project is well underway, and Mr. Paul Burchell of the Conservation Commission reports that to date several samples have been shipped to the Bureau's Research Center at Bartlesville, Oklahoma.

## SO. UTAH COALS

Professor Richard Robison, Geology Dept., Univ. of Utah, has been mapping coal occurrences in the Tropic area of south-central Garfield County this summer with the support of Uniform School Funds. The Utah Geological Survey plans to publish the results of his work in 1965. Several students are presently working with Cretaceous correlations in the same area, and the results of their studies should also be available in 1965.

Water Runoff = Precipitation -  
(Infiltration + Evaporation  
and Transpiration)

# NEW INTRUSIVE FOUND IN GARFIELD COUNTY

Field parties of the Utah Geological Survey have reconnoitered an intrusion found in northwestern Garfield County. The intrusion, tentatively designated as the Spry stock, is at least seven miles in length and six miles in width; preliminary work indicates that it may be of batholith proportions. The intrusion lies astraddle U.S. Highway 89 between the town of Circleville and Panguitch. Hand-specimen identification of the rock indicates that it is a quartz monzonite.

The intrusion is well exposed except for peripheral zones. Some al-

teration has been noted along the northwest margin in Dog Valley.

Tertiary and Tertiary? sediments are domed and mildly deformed over and around the intrusion. The intrusion is surrounded by volcanics.

Dr. Hellmut H. Doelling has made a preliminary study and map of the area, and is presently preparing data for a future paper. Mr. John Anderson, University of Texas, studying the Tectonics of Bear Valley in northeastern Iron County, will cover the southeast corner of the intrusion.

## MILFORD AREA

The Star Mining District, west of Milford in central Beaver County, is being thoroughly studied by Dr. James Whelan, Dept. of Mineralogy, Univ. of Utah, and four graduate students and assistants. The results of this combined endeavor may be compiled as a Mining District Document, a proposed new publication series of larger format than a standard bulletin and of scope paralleling a professional paper.

Professors Stringham and Erickson, also of the U. of U. Dept. of Mineralogy, are working smaller areas in the vicinities of the Horn Silver Mine and the Wah Wah Pass area.

All projects are supported by Uniform School Funds, with token support from the Utah Geological Survey.

## ASPHALT RIDGE

A field party has spent the summer mapping on Asphalt Ridge a few miles southwest of Vernal, Utah. Upon completion of the analytical work on the tar sands, the data will be compiled and released

in a Utah Geological Survey publication. It is hoped that a realistic reserve estimate will result.

## CENTRAL UTAH

The Utah Geological Survey has undertaken mineral resource studies in Garfield, Piute, Sanpete, Sevier, and Wayne Counties. Field work is presently nearing completion, and publication of some of the data on a county basis is planned in early 1965. State lands have been especially reconnoitered in hopes that royalties and revenues may be developed for greater support of Utah schools.

## DEEP CREEK MTNS.

The Deep Creek Mountains and the southern extension of the Gold Hill Mining District are being extensively studied by Mr. Kenneth C. Thomson with the support of the Utah Geological Survey. Major emphasis is being placed on mineral deposits; geochemical methods will be employed to determine their net worth in the area. The study is to continue through the 1965 field season.

## CERTIFICATION

### An Editorial Comment

by R. E. Cohenour

In recent years there has been a great deal of discussion concerning registration and certification of the various divisions within the geological (earth science) profession. Whether or not much attention is to be given this matter is purely an individual choice.

The following observations may be made, however:

"Certified" or "Registered (blank) Engineer" is the elite end product for various practicing engineers. Should the same be true for those of us in the geological realm? In some states groups of a particular earth science discipline are now attempting to become "certified," and little regard is being given to the general geologist who by experience and training may be qualified in a specific discipline, but who does not have an engineering or other qualifying degree.

Another factor to consider — If more and more distinct groups continue to break away and become a legally recognized "certified" something or other, more and more facets of the earth sciences will be denied to the remainder of the profession. It seems that the profession should take stock and decide as an entire body whether or not to unite in the fight for registration. If not, the profession may succumb to burgeoning, existing professional certification programs.

Information regarding certification and registration may be obtained by writing to: American Institute of Professional Geologists, P.O. Box 836, Colorado 80402; or Jack Q. Tomkins, Consultant Utah Coordinator, AIPG, 1425 East 9th South, Salt Lake City, Utah, 84105.

If you have a news item or announcement of interest to the readers of *QUARTERLY REVIEW*, please forward it to the Utah Geological Survey, c/o Editor, 103 Civil Engineering Bldg., University of Utah, Salt Lake City, Utah 84112. There will be four issues each year — February, May, August, November.

## NAWAPA Something to Think About

A governmental alphabet with international implications — the North American Water and Power Alliance is a gigantic water plan involving the United States, Canada, and Mexico, and is designed by the Ralph M. Parsons Company of Los Angeles and New York. In essence the plan involves bringing Alaskan and Canadian waters into the water-shortage areas of Canada, Western United States, and Northern Mexico.

The plan is to be self-liquidating, and, based upon current costs, sales of water and power from the system apparently could exceed 4 billion dollars annually. The total project would cost 100 billion dollars and would entail another 10 years for planning, treaties and agreements, and at least 20 years for complete construction.

The system would utilize four drainage areas: the Yukon, Peace River, Rocky Mountain Trench, and the Clark-Snake. The total areas comprise approximately 1,300,000 square miles, with an average runoff of 660 million acre-feet. About 110 million acre-feet would be utilized by the Plan for irrigation, industrial, and municipal uses.

The NAWAPA Plan involves the Columbia River Basin and Colorado River Basin now under development, but neither would be adversely affected.

Water requirements of the North American Desert area — the Basin and Range Province — would be drawn from the Rocky Mountain Trench and combined with conservable flows from mountain streams of the Great Basin subsystem. Storage and transmission would be by a system of reservoirs, aqueducts, lift-pump stations, and hydropower plants. Irrigation water would be distributed to Idaho, Oregon, Utah, Nevada, California, Chihuahua, and Sonora in Mexico. Utah's annual share would be approximately 6 million acre-feet for irrigation and 1,500,000 acre-feet for industrial and municipal use.

The NAWAPA concept is far-sighted and enormous in scope — 32 billion cubic yards of earth would be moved and 860 million cubic yards of tunneling. Over 5 billion dollars would be spent for tools and equipment. The project would require 100 thousand tons of copper and aluminium, 30 million tons of steel, 200 million sacks of cement, and 25 billion dollars in labor. However, thirty-three states would be direct beneficiaries, and the entire country would benefit from the resulting economic improvement.

(Information pertaining to the above was taken from *News and Views* No. 7, by Ralph M. Parsons Co.)

## Metrological Study of Lake Evaporation

From July 1 to Sept. 19, 1964, the U. of U. Meteorology Dept., sponsored by the Earth Science Development Project of the Uniform School Fund, has been conducting a study to obtain an estimate of the annual evaporation from Great Salt Lake. As part of this study, four individuals, making up two teams, have been living night and day on the shores of the lake, taking the necessary measurements to obtain this estimate. They are: Richard Nelson, a Meteorology student from Pennsylvania State Univ.; David Powell, a Meteorology graduate student at the U. of U.;

Sherman Ross and Michael Averett, freshmen at the U. of U.

The two observation stations are located at extreme points from each other. Mobile station #1 is on the west side of the lake at Stansbury Island, 57 miles from Salt Lake City; mobile station #2 is on the north side of the lake at Rozel Point, 114 miles from Salt Lake City.

Every hour the observers record air temperature, water temperature, and dew point temperature. From anemometers mounted on a tower, they record wind velocity at elevations 2, 4, and 8 meters above ground.